Letters to the Editor: Land Use in LCA

We seldom think of what we have, but always think of what we miss

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Introduction

Thank you Llorenç and co-authors for your sophisticated and comprehensive article on the key issues of 'Land Use in LCA' [1]. It's good to see that some very relevant people could consolidate their knowledge and experience on this topic. From a scientific or methodological point of view, I have neither additions nor criticisms. I found it a sound and fair preparatory article of the related framework. Llorenç, I hope you receive some interesting papers related to your field as Subject-Editor. In my quest to see the topic of 'Land Use' integrated more and more in daily practice, I would like to share some experiences and add some comments and view points with you and the community. I know that some scientific processes can be complicated. Therefore, please forgive this rather personal perspective – I would like to 'grease' our current workflow and accelerate the *application* of 'Land Use in LCA' in stepping back a bit to look at the topic from a more overall position.

1 Land Use in LCA: Discussed with different intentions

My work on 'Land Use' started in 1996, not due to a personal interest in the topic, but due to a very practical reason. There was an industry project on LCA data set-up in the building material sector; because, e.g., wood and mineral constructions were side by side in the same database, the question of the value of 'Land Use' came up: The consortium requested answers on the comparative effects of mining and forestry, etc. Then, in 1997, at the SETAC conference in San Francisco, the land-quality over time diagram appeared in LCA, to my knowledge, for the first time. Well, so far so good. This diagram is still in use. Of course today's diagrams show much more detail, but the principal approach is still the same. In the following years including the SETAC working groups 1998 to 2001, a somewhat embarrassing discussion emerged on how to measure the quality of land use. It was around this time that I considered to drop the topic. I don't want to dwell on past discussions but to emphasize that we lost time. I had the feeling that the goal was to defend paradigms rather than to allow an open forum to consolidating important concepts.

2 Advancement wanted: Thesis → Antithesis → Synthesis

Despite a lot of working groups' time being wasted during 3 years of scientific sightseeing at different SETAC conferences, a final report of the working groups was consolidated, although mostly driven by a few individuals, so the assiduous editor, Erwin Lindeijer. In my opinion, one of the most important players during this time was Ruedi Müller-Wenk, who consistently channelled diverting arguments towards a synthesis. Thank you, Ruedi, for your commitment to that seemingly impossible task! From 2001, a time followed where some individuals pushed the theme forward – mostly driven by personal interests (in most cases – including mine – the driving force was the completion of a doctoral thesis). Reading Llorenç's article [1], three main topics turn out for impacts that characterize 'land quality' within LCA:

- Impacts on biodiversity;
- Impacts on biotic production potential; and,
- Impacts on soil and life support functions.

It is interesting to see that each of the other main topics has been adopted by at least one active person (Thomas Köllner on vascular plant diversity, Erwin Lindeijer on impacts on biotic production and Llorenç Mila i Canals on soil quality).

3 Closing the gap between scientific approaches and daily use

Some people believe that biodiversity loss from destructive land use would have turned out to become a 'hotter' topic than climate change if the scientific community had only provided some simple indicators at an earlier stage. Scientists for Global Warming **did** provide early indicators; despite suspecting that the correlations were not really correct in absolute terms, the factors were consistent in themselves and in relation to each other. New indicators have continually been generated and old ones corrected. The resulting factors (used in LCA) are so simple that (even) politicians rely on them in their decisions.

Meanwhile, scientists have taken decades to discuss the characteristics of correct indicators for Biodiversity loss or Land Use. The community failed to 'practice on the job', and in the meantime, politicians make their decisions without the means of a quantitative perspective for the biodiversity or land use situation in relation to the traditional impacts.

4 Collect inventory data and try it out

There is only one path to bringing 'Land Use' and 'Biodiversity' into practice. LCA practitioners should interpret and 'sell' land use information in LCA projects as self-evidently as they practice Global Warming figures. In my opinion, we simply have to intensify the collection and use of information on 'Land Use' in LCIs. It is better to make decisions

based on premature models with data gaps than to make decisions without any information at all. People will decide anyway: They don't wait. Furthermore, Land Use indicator models need not be *perfect*: It would be *sufficient* to match the quality range of Global Warming indicators!

Thus in my perspective, there are only three *essential* requirements for LCI data and indicators on 'Land Use' in LCA, which are:

- additive over the process chain,
- scalable over the process chain,
- consistent in themselves and in relation to each other.

The *sufficiency* of these requirements will probably be determined by the indicators' use in practice and the availability of data (as it happened with the traditional indicators).

5 Can we learn from other impacts?

Confucius[1] defined three ways to wisely tackle a problem:

Solving the problem by thinking about the problem – the most demanding way

Solving the problem by copying from others – the easiest way

Solving the problem by trying it out – the hardest way

I guess we are left with taking the hardest way: we have tried the demanding way and we cannot simply copy aspects from other impacts due to the individual nature of Land Use.

We should remember that we already have methods and approaches available. Let's try out what we already have and integrate land use into daily practice step by step, rather than keeping on to discuss which further steps we need to take to do it correctly. Possibly the most difficult decision to be made is: Which bridges to use and which ones to break off?

Llorenç, good luck. I think you are the right person for this demanding job. I hope that you get all the support you need.

[1] This may not be the original translation, but I think it communicates the same message.

[1] Milà i Canals L, Bauer C, Depestele J, Dubreuil A, Freiermuth Knuchel R, Gaillard G, Michelsen O, Müller-Wenk R, Rydgren B (2007): Key elements in a framework for land use impact assessment in LCA. Int J LCA 12 (1) 5–15

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Key Elements in a Framework for Land Use Impact Assessment Within LCA

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Abstract

Background, Aims and Scope. Land use by agriculture, forestry, mining, house-building or industry leads to substantial impacts, particularly on biodiversity and on soil quality as a supplier of life support functions. Unfortunately there is no widely accepted assessment method so far for land use impacts. This paper presents an attempt, within the UNEP-SETAC Life Cycle Initiative, to provide a framework for the Life Cycle Impact Assessment (LCIA) of land use.

Main Features. This framework builds from previous documents, particularly the SETAC book on LCIA (Lindeijer et al. 2002), developing essential issues such as the reference for occupation impacts; the impact pathways to be included in the analysis; the units of measure in the impact mechanism (land use interventions to impacts); the ways to deal with impacts in the future; and bio-geographical differentiation.

Results. The paper describes the selected impact pathways, linking the land use elementary flows (occupation; transformation) and parameters (intensity) registered in the inventory (LCI) to the midpoint impact indicators and to the relevant damage categories (natural environment and natural resources). An impact occurs when the land properties are modified (transformation) and also when the current man-made properties are maintained (occupation).

Discussion. The size of impact is the difference between the effect on land quality from the studied case of land use and a suitable reference land use on the same area (dynamic reference situation). The impact depends not only on the type of land use (including coverage and intensity) but is also heavily influenced by the bio-geographical conditions of the area. The time lag between the land use intervention and the impact may be large; thus land use impacts should be calculated over a reasonable time period after the actual land use finishes, at least until a new steady state in land quality is reached.

Conclusion. Guidance is provided on the definition of the dynamic reference situation and on methods and time frame to assess the impacts occurring after the actual land use. Including the occupation impacts acknowledges that humans are not the sole users of land.

Recommendations and Perspectives. The main damages affected by land use that should be considered by any method to assess land use impacts in LCIA are: biodiversity (existence value); biotic production potential (including soil fertility and use value of biodiversity); ecological soil quality (including life support functions of soil other than biotic production potential). Bio-geographical differentiation is required for land use impacts, because the same intervention may have different consequences depending on the sensitivity and inherent land quality of the environment where it occurs. For the moment, an indication of how such task could be done and likely bio-geographical parameters to be considered are suggested. The recommendation of indicators for the suggested impact categories is a matter of future research.

Keywords: Biodiversity; bio-geographical differentiation; dynamic reference situation; land quality; land use; land use impacts; LCA; LCIA; natural environment; natural resources; site-dependency; soil quality